Notice No.1

Rules and Regulations for the Classification of Naval Ships, January 2020

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: June 2020

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Volume 1, Part 1, Chapter 2, Sections 2, 3 & 6	1 July 2020	NA
Volume 1, Part 1, Chapter 3, Section 2	1 July 2020	NA
Volume 1, Part 3, Chapter 5, Sections 6 & 8	1 July 2020	NA
Volume 1, Part 6, Chapter 6, Sections 2 & 7	1 July 2020	NA
Volume 1, Part 6, Chapter 6, Section 4	1 July 2020	1 July 2020

Lloyd's Register

Volume 1, Part 1, Chapter 2
Classification Regulations

■ *Section 2*
Scope of the Rules

2.1 Applicable ship types

(Part only shown)

2.1.1 The Rules are applicable to naval ships designed and constructed for the purpose of carrying and operating naval systems. For the purposes of Classification, naval ships can be grouped into five categories as follows:

(d) **NS(SR) ships**

This category covers auxiliary naval ships used for the support of civil and naval operations. They may have a variety of roles including the movement of military and other personnel, ammunition, vehicles, stores and fuels and the transfer of such to other naval ships. They do not have a defined military role but may have a limited self-defence capability. In general, the ships will comply with LR's ~~Rules for Ships~~ *Rules and Regulations for the Classification of Ships, July 2019* and any relevant requirements in *Vol 1, Pt 1, Ch 2, 3.5 Ship type notations 3.5.6* for new vessels or *Vol 1, Pt 1, Ch 3, 17 Classification of ships built under survey to LR Classification Rules and Regulations other than LR Naval Ship Rules and Regulations* for existing vessels; and satisfy as far as practicable the requirements of the International Conventions applicable to the ship type. Any deviation from the applicable International Conventions requires agreement with the Owner or Naval Administration and where applicable the National Administration. A Design and Operating Scenario Statement declared by the Owner stating the role of the ship in terms of the carriage of equipment, personnel, stores and fuels, in accordance with *Vol 1, Pt 1, Ch 2, 3.5 Ship type notations 3.5.7*, is to be acceptable to LR. Where an **NS(SR)** notation is applicable, the requirements of the *Rules and Regulations for the Classification of Ships, July 2019, Pt 1, Ch 2 Classification Regulations* are not applicable and the requirements of this Chapter are to be applied.

(e) **NS(SSC) ships**

~~This category covers ships that have been designed and built using the~~ This category is limited to ships typically below 1500 tonnes displacement or 110 m length. They do not have a defined military role but may have a limited self-defence capability and are usually designed and constructed for constabulary purposes such as coastal defence or patrol duties. In general, the ships will comply with LR's *Rules and Regulations for the Classification of Special Service Craft, July 2019* ~~(hereinafter referred to as the Rules for Special Service Craft)~~ and any relevant requirements in *Vol 1, Pt 1, Ch 2, 3.5 Ship type notations 3.5.6* for new vessels or *Vol 1, Pt 1, Ch 3, 17 Classification of ships built under survey to LR Classification Rules and Regulations other than LR Naval Ship Rules and Regulations* for existing vessels; ~~This category is limited to ships typically below 1500 tonnes displacement or 110m length. They do not have a defined military role but may have a limited self-defence capability and are usually designed and constructed for constabulary purposes such as coastal defence or patrol duties. In general,~~ and satisfy as far as practicable the requirements of the ~~ships are required to comply with~~ International Conventions applicable to the ship type. ~~Deviations~~ Any deviation from the applicable International Conventions requires agreement with the ~~Navy~~ Owner or Naval Administration and where applicable the National Administration. A Design and Operating Scenario Statement declared by the Owner stating the role of the ship in terms of the carriage of equipment, personnel, stores and fuels, in accordance with *Vol 1, Pt 1, Ch 2, 3.5 Ship type notations 3.5.7*, is to be acceptable to LR. Where an **NS(SSC)** notation is applicable, the requirements of the ~~Rules for Special Service Craft~~ *Rules and Regulations for the Classification of Special Service Craft, July 2019*, *Pt 1, Ch 2 Classification Regulations* are not applicable and the requirements of this Chapter are to be applied.

■ *Section 3*
Character of Classification and Class notations

3.5 Ship type notations

(Part only shown)

3.5.2 A list of ship type notations for which a ship may be eligible is:

- **NS1** This notation will be assigned to NS1 category naval ships, as defined in *Vol 1, Pt 1, Ch 2, 2.1 Applicable ship types 2.1.1(a).*
- **NS(SSC)** This notation will be assigned to NS(SSC) category naval ships, as defined in V*ol 1, Pt 1, Ch 2, 2.1 Applicable ship types 2.1.1**(e).***

(Part only shown)

3.5.6 **NS(SR) and NS(SSC) ~~V~~vessels**

For vessels that are using either the **NS(SR)** or **NS(SSC)** ship type notations, the following requirements are to be complied with:

(b) Where vessels are to be built to these notations, the requirements set out in ~~*Vol 1, Pt 1, Ch 2, 3.5 Ship type notations 3.5.8*~~ *Vol 1, Pt 1, Ch 2, 3.5 Ship type notations 3.5.7* are also to be complied with.

3.10 Other notations

3.10.27 **HCD1()**. This ShipRight notation will be assigned when the development and operation of specified ship system(s) has been carried out in accordance with the process for 'Level 1 – Reactive' detailed in the *ShipRight Procedure for Human-centred*

Design. The names of the systems which meet the requirements will be listed as a suffix to the character, e.g. **HCD1**(mooring area, ECDIS).

■ *Section 6*
Classification of machinery with [✠]LMC or MCH notation

6.3 Survey and inspection

(Part only shown)

6.3.3 Acceptance of manufacturer's certificates for items of machinery for propulsion (including propulsion gearing with single input/output arrangements) and for electrical power generation and for other auxiliary machinery for essential services, where the [✠]**LMC** notation is to be assigned, is subject to the following conditions:

(a) The vessel is an NS3 ship, an NS(SR) ship~~,~~ or an NS(SSC) ship of less than 500 gross tonnage or is a ship of 500 gross tonnage or greater and is not required to comply with ~~i~~International ~~c~~Conventions applicable to a ship with unrestricted service.

(b) Propulsion power is provided by engines or gas turbines which have been type approved in accordance with LR requirements for marine application.

(c) Electrical power is provided by generators driven by engines or gas turbines which have been type approved in accordance with LR requirements for marine application.

Existing listed items b, c and d have been renumbered d, e and f.

(Part only shown)

6.3.4 Acceptance of the manufacturer's certificate for propelling and essential auxiliary machinery, where the ~~MCH~~**MCH** notation is to be assigned, is subject to the following conditions:

(a) The ship is an NS3 ship, an NS(SR) ship~~,~~ or an NS(SSC) ship of less than 500 gross tonnage or is a ship of 500 gross tonnage or greater and is not required to comply with ~~i~~International ~~c~~Conventions applicable to a ship with unrestricted service.

(b) Propulsion power is provided by engines or gas turbines which have been type approved in accordance with LR requirements for marine application.

(c) Electrical power is provided by generators driven by engines or gas turbines which have been type approved in accordance with LR requirements for marine application.

Existing listed items b, c and d have been renumbered d, e and f.

Volume 1, Part 1, Chapter 3
Periodical Survey Regulations

■ *Section 2*
Annual Surveys – Hull, machinery and optional requirements

2.3 Machinery

2.3.14 Where lithium battery system installations are used as a power source for Mobility, Ship Type, Ancillary or emergency systems, testing is to be conducted in accordance with the trials requirements in *Vol 2, Pt 9, Ch 12, 1 Testing and trials, Table 12.1.3 Test requirements on lithium battery systems.* The following aspects of the battery space are to be inspected, as applicable to the installation:

(a) structural fire protection;
(b) fixed fire detection;
(c) HVAC, ventilation, cooling, smoke extraction, fire damper systems
(d) fixed and portable extinguishing; and
(e) escape and EEBD (emergency escape breathing device).

Existing paragraphs 2.3.14 to 2.3.18 have been renumbered 2.3.15 to 2.3.19.

Volume 1, Part 3,
Chapter 5 Anchoring, Mooring, Towing, Berthing, Launching, Recovery and Docking

■ *Section 6*
Mooring arrangements

6.3 Mooring lines (Equipment Number > 2000)

(Part only shown)

6.3.2 The strength of mooring lines and the number of head, stern, and breast lines for ships with an Equipment Number > 2000 ~~are~~is based on the side-projected area A_1. Side projected area A_1 is to be calculated similar to the side-projected area A according to *Vol 1, Pt 3, Ch 5, 2.1 Equipment Number calculation* but considering the following conditions:

(b) Wind shielding of the pier can be considered for the calculation of the side-projected area A_1 unless the ship is intended to be regularly moored to jetty type piers. The lower part of the side projected area above the waterline for the considered loading condition can be disregarded up to the pier height in the calculation of the side-projected area A_1. ~~Actual height of the pier above the waterline is to be used in the calculation but in general not to exceed 3 m.~~ Where known, the actual height of the pier above the waterline may be used in the calculation. If the pier height cannot be pre-determined, an assumed height may be used. However, in both cases, the pier height shall not exceed 3 m.

■ *Section 8*
Anchor windlass design and testing

8.12 Marking and identification

8.12.1 The windlass is to be permanently marked with the following information:

(a) ~~Nominal size of the cable chain including mean diameter, grade and percentage of the breaking load the windlass is designed to hold. (E.g. 100/3/45)~~ The size designation of the windlass (e.g. 100/3/45, where 100 is the nominal diameter of the chain cable in mm, 3 is the numeral in the chain cable steel grade U3, and 45 refers to the holding load expressed as a percentage of the chain cable breaking load).

(b) Maximum anchorage depth, in metres.

Volume 1, Part 6, Chapter 6
Material and Welding Requirements

■ *Section 2*
Materials

2.2 Grade of steel

2.2.3 The material class and minimum grade requirements specified in *Table 6.2.1 Material classes and grades* and *Table 6.2.2 Steel grades for normal operation* are applicable for normal service, which assumes navigation to areas where the lowest mean daily average air temperature is not less than -10°C

2.2.4 The material grade of the exposed structure of ships intended to operate in external air temperatures below -10°C, including all ships designed for sea area SA1, is to be in accordance with *Vol 1, Pt 6, Ch 6, 2.4 Ships operating in cold weather conditions.*

Existing paragraphs 2.2.3 to 2.2.4 have been renumbered 2.2.5 to 2.2.6.

~~2.2.5~~ 2.2.7 Where tee or cruciform connections employ full penetration welds, and the ~~When~~ plate material~~, intended for welded construction, will be~~ is subject to significant strains in a direction perpendicular to the rolled surfaces, it is recommended that consideration be given to the use of special plate material with specified through thickness properties, and tested in accordance with *Ch 3, 8 Plates with specified through thickness properties* of the *Rules for the Manufacture, Testing and Certification of Materials, July 2019*. The plan should indicate the material grade followed by the letter Z (e.g. DZ, DHZ).

2.4 Ships operating in cold weather conditions

Existing paragraph 2.4.1 has been deleted.

2.4.1 For ships intended to operate in areas with external air temperatures below -10°C MDAT, e.g. regular operations during winter seasons to Arctic or Antarctic waters, the material grade requirements of structures above the Cold Waterline are not to be of lower grades than those given in *Table 6.2.5 Material classes and grades for structures exposed to low air temperatures*, *Table 6.2.6 Materials for Class I for low air temperatures*, *Table 6.2.7 Materials for Class II for low air temperatures* and *Table 6.2.8 Materials for Class III for low air temperatures* for the specified design air temperature.

2.4.2 The specified design air temperature is to be selected by the Owner based on the lowest mean daily average temperature (MDAT) for the area and period of operations considered in the Concept of Operations.

where

Mean	= statistical mean over a minimum of 20 years
Average	= average during one day and one night
Lowest	= lowest during the year
MDHT	= Mean Daily High Temperature
MDAT	= Mean Daily Average Temperature
MDLT	= Mean Daily Low Temperature

Note The MDLT is used as the reference baseline for the *Rules for the Winterisation of Ships, July 2019* and IMO Polar Code, and is typically taken as 3°C lower than the MDAT.

Figure 6.2.1 Design air temperature shows the definition graphically.

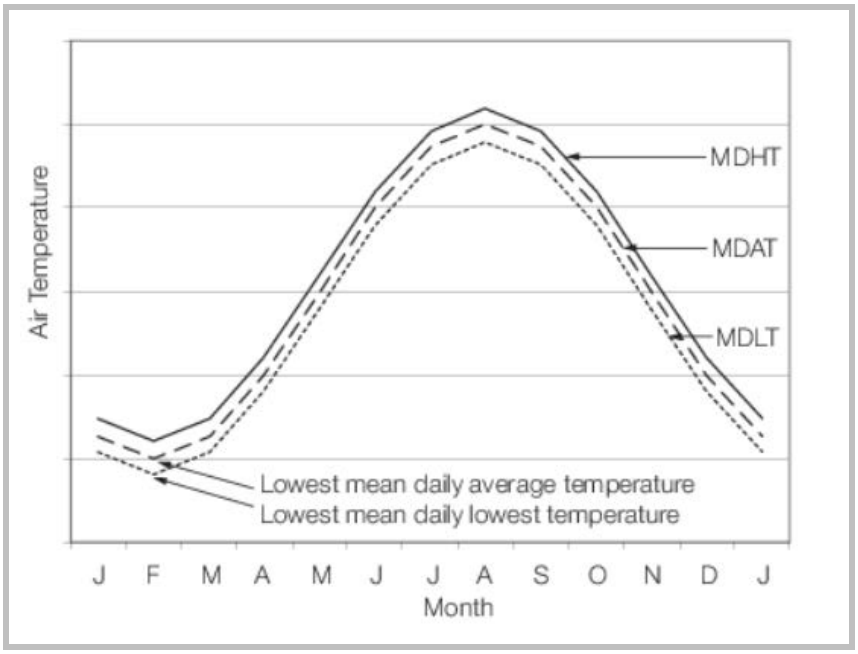

Figure 6.2.1 Design air temperature

~~2.4.2~~ 2.4.3 Unless otherwise specified, all ships designed for sea area **SA1** ~~and other ships intended to operate for extended periods in cold weather conditions, the material class and minimum grade requirements dependent on thickness are to be in accordance with *Table 6.2.5 Material classes and grades for structures exposed to low temperatures* and *Table 6.2.6 Steel grades for cold weather.* The requirements~~ are to be designed for ~~based on~~ a lowest mean daily average design air temperature of -30°C MDAT or lower. ~~Where an alternative design air temperature is required, the choice of material grades will be specially considered, *see also* the *Rules for the Winterisation of Ships, July 2019.*~~ However, where agreed, materials for SA1 ships not intended for operations in cold weather conditions may be based on requirements for normal service for higher design air temperatures (-10°C MDAT or higher).

2.4.4 Where the material class in *Table 6.2.1 Material classes and grades* is higher than in *Table 6.2.5 Material classes and grades for structures exposed to low air temperatures*, the higher material class is to be applied.

2.4.5 For ships where the optional **Winterisation H** notation is applied, *see* *Rules for the Winterisation of Ships, July 2019*, note that the external design air temperature defined in the *Rules for the Winterisation of Ships, July 2019* is taken as 13°C lower than

the design air temperature, i.e. if the design air temperature is -12°C MDAT, then the external design air temperature for the application of the *Rules for the Winterisation of Ships, July 2019* is -25°C (-12°C MDAT minus 13°C).

2.4.6 For ships where a Polar Service Temperature (PST) is to be assigned, note that the PST is taken as 13°C lower than the design air temperature, i.e. if the design air temperature is -12°C MDAT, then the PST for the application of the Polar Code is -25°C (-12°C MDAT minus 13°C).

Existing paragraphs 2.4.3 to 2.4.6 has been renumbered 2.4.7 to 2.4.10.

Existing Table 6.2.6 Steel grades for cold weather has been deleted.

Table 6.2.6 Materials for Class I for low air temperatures

Thickness, in mm	Design air temperature									
	-11°C to -15°C		-16°C to -25°C		-26°C to -35°C		-36°C to -45°C		-46°C to -55°C	
	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT
≤10	A	AH	A	AH	B	AH	D	DH	D	DH
10-15	A	AH	B	AH	D	DH	D	DH	D	DH
15-20	A	AH	B	AH	D	DH	D	DH	E	EH
20-25	B	AH	D	DH	D	DH	D	DH	E	EH
25-30	B	AH	D	DH	D	DH	E	EH	E	EH
30-35	D	DH	D	DH	D	DH	E	EH	E	EH
35-45	D	DH	D	DH	E	EH	E	EH	-	FH
45-50	D	DH	E	EH	E	EH	-	FH	-	FH

Note. MS and HT are defined as Mild Steel and High Tensile Steel respectively.

Table 6.2.7 Materials for Class II for low air temperatures

Thickness, in mm	Design air temperature									
	-11°C to -15°C		-16°C to -25°C		-26°C to -35°C		-36°C to -45°C		-46°C to -55°C	
	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT
≤10	A	AH	B	AH	D	DH	D	DH	E	EH
10-20	B	AH	D	DH	D	DH	E	EH	E	EH
20-30	D	DH	D	DH	E	EH	E	EH	-	FH
30-40	D	DH	E	EH	E	EH	-	FH	-	FH
40-45	E	EH	E	EH	-	FH	-	FH	-	FH
45-50	E	EH	E	EH	-	FH	-	FH	-	FH

Note. MS and HT are defined as Mild Steel and High Tensile Steel respectively.

Table 6.2.8 Materials for Class III for low air temperatures

Thickness, in mm	Design air temperature									
	-11°C to -15°C		-16°C to -25°C		-26°C to -35°C		-36°C to -45°C		-46°C to -55°C	
	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT
≤10	B	AH	D	DH	D	DH	E	EH	E	EH
10-20	D	DH	D	DH	E	EH	E	EH	-	FH
20-25	D	DH	E	EH	E	EH	E	EH	-	FH
25-30	D	DH	E	EH	E	EH	-	FH	-	FH
30-35	E	EH	E	EH	-	FH	-	FH	-	FH
35-40	E	EH	E	EH	-	FH	-	FH	-	FH
40-50	E	EH	-	FH	-	FH	-	FH	-	FH

Note. MS and HT are defined as Mild Steel and High Tensile Steel respectively.

■ *Section 4*

Requirements for welded construction

4.6 Inspection of Welds

4.6.2 All finished welds are to be subjected to non-destructive examination in accordance with the requirements specified in Ch 13, 2.12 Non-destructive examination of welds of the ~~Rules for Materials~~ Rules for the Manufacture, Testing and Certification of Materials, July 2019, and the general NDE requirements as per Ch 1, 5.1 General NDE Requirements of the Rules for the Manufacture, Testing and Certification of Materials, July 2019.. Details of weld defect levels are given in the Naval Survey Guidance for Steel Ships.

■ *Section 7*

Inspection and testing procedures

7.1 General

7.1.1 The test procedures detailed in this Section are to be used to confirm the watertightness of tanks and watertight boundaries, the structural adequacy of tanks and the weathertightness of structures.

Existing paragraphs 7.1.1 and 7.1.2 have been renumbered 7.1.2 and 7.1.3.

~~7.1.3~~ 7.1.4 The testing requirements for gravity tanks, defined as tanks subject to a vapour pressure not greater than 70 kN/m^2, ~~tanks, including~~ independent tanks~~,~~ and watertight and weathertight compartments~~,~~ are listed in *Table 6.7.1 Testing requirements.* Tests are to be carried out in the presence of the Surveyor at a stage sufficiently close to completion such that the strength and tightness are not subsequently impaired by subsequent work and prior to any sealing and cement work being applied over joints.

7.1.5 For naval vessels which are also required to comply with SOLAS, structural testing is to be carried out for all tanks forming part of the watertight sub-division of the ship in accordance with SOLAS requirements unless:

(a) the shipyard provides documentary evidence of the Owner's agreement to a request to the appropriate Naval or Flag Administration for an exemption from the application of SOLAS Chapter II-1 *Regulation 11 - Initial testing of watertight bulkheads, etc.*, or for an exemption agreeing that the proposed alternative approach is equivalent to SOLAS Chapter II-1 *Regulation 11 - Initial testing of watertight bulkheads, etc.*; and

(b) the above-mentioned exemption/equivalency has been granted by the responsible Naval or Flag Administration.

7.1.6 The testing of structures not listed in this Section is to be specially considered.

Existing sub-Section 7.2 has been deleted and replaced with the following.

7.2 Test types

7.2.1 The types of test specified in this Section are:

(a) Structural test, which is to be conducted to verify the tightness and structural adequacy of the construction of tanks. This may be a hydrostatic test or, where the situation warrants, a hydropneumatic test.

(b) Leak test, which is to be used to verify the tightness of a boundary. Unless a specific test is indicated, this may be a hydrostatic, hydropneumatic test, air or other medium test.

(c) Gastight test, which is to be used to verify the gas tightness of a boundary using a pressure drop test.

Table 6.7.1 Testing requirements

Item to be tested	Testing procedure	Installation testing requirement
Double bottom tanks	~~Structural (1)~~Leak and structural	The greater of: (3) — head of water up to the top of the overflow — head of water representing the maximum pressure experienced in service for which elastic design criteria were used. — head of water 2,4 m above top of tank for NS1 ships (3) — head of water 1,8 m above top of tank for NS2 and NS3 ships (3)
~~Cofferdams~~	~~Structural (1)~~	The greater of: (3) — head of water up to the top of the overflow ~~— 1,8 m head of water above highest point of tank (4)~~ — head of water 2,4 m above top of tank for NS1 ships (3) — head of water 1,8 m above top of tank for NS2 and NS3 ships (3)
Peak tanks (2) ~~Fore peak and after peak used as tank (3)~~	~~Structural~~ Leak and structural	
~~Tank bulkheads~~	~~Structural (1)~~	The greater of: (3) — head of water up to the top of the overflow ~~— 1,8 m head of water above the highest point of tank (4)~~
Deep tanks	~~Structural (1)~~Leak and	

	structural	~~— setting pressure of the safety valves, where relevant~~ — head of water 2,4 m above top of tank for NS1 ships — head of water 1,8 m above top of tank for NS2 and NS3 ships — head of water up to top of tank, plus setting of fitted pressure relief valves
~~Fuel oil tanks~~	~~Structural~~	
Scupper and discharge pipes in way of tanks	~~Structural (1)~~Leak and structural	
Sea inlet boxes Sonar ~~domes~~spaces	Leak ~~Structural (1)~~	~~— head of water up to the damage control deck/ vee line~~ *See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*
Speed and depth instrument compartments	~~Structural (1)~~Leak	~~— head of water up to the damage control deck/ vee line~~ ~~— top of the header tank~~ *See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*
Double plate rudders blades and bilge keels	~~Structural (1), (5)~~Leak	~~2,4 m head of water, and rudder should normally be tested while laid on its side~~ *See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*
~~Double plate bilge keels~~	~~Structural (1)~~	~~— head of water up to the design waterline~~
Watertight bulkheads, shaft tunnels, flats and recesses, etc.	~~Hose (2)~~Leak (4)	*See Vol 1, Pt 6, Ch 6, 7.5~~6~~ Leak ~~Hose~~ testing*
Watertight doors, hatches and closing appliances (below the vertical limit of watertight integrity) when fitted in place	~~Hose (6) and (7)~~Leak (4), (5) and (9)	
Shell doors when fitted in place	Leak (4) and (6)	
Weathertight hatch covers, doors and closing appliances (above the vertical limit of watertight integrity)	~~Hose~~ Leak (4)	
Shaft tunnel clear of deep tanks	Leak (4)	
Cofferdams	Leak	
Peak spaces with equipment	Leak	
~~Fore peak~~Peak voids ~~not used as a tank~~	~~Hose (2)~~Leak	
Chain locker~~, if aft of collision bulkhead~~	~~Structural~~ Leak and structural	Head of water up to the top of the ~~overflow~~spurling pipe
Independent/~~S~~separate fuel oil tanks (11) Filling trunks	~~Structural~~ Leak and structural	~~Head of water representing the maximum pressure which could be experienced in service for which elastic design criteria were used, but not less than 3,5 m~~ Head of water equal to the maximum to which the tanks/trunks may be subjected, but not less than 2,5 m above the top of the tank/trunk. (3)
~~After peak not used as a tank~~	~~Leak~~	~~*See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*~~
Magazines	Leak ~~(6) and~~ (8)	*See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*
Double bottom and double side voids (1)	Leak	*See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*
LO sump tanks and other similar tanks/spaces under main engines	Leak (10)	*See Vol 1, Pt 6, Ch 6, 7.5 Leak testing*
Ballast ducts	Leak and structural	The greater of: — ballast pump maximum pressure — setting of pressure relief valve
Note *1*. ~~Leak or hydropneumatic testing may be accepted, provided that at least one tank of each type is structurally tested, to be selected in connection with the approval of the design, s~~*See Vol 1, Pt 6, Ch 6, 7.7 Hydropneumatic testing.* Includes double bottom dry compartments and duct keels as well as voids used for the protection of fuel oil tanks and pump rooms. ~~**Note** *2*. When hose testing cannot be performed without damaging possible outfittings already installed, it may be replaced by a careful visual inspection of all the crossings and welded joints. Where necessary, dye penetrant test or ultrasonic leak test may be required.~~		
Note ~~*3*~~*2*. ~~Where applicable testing~~Testing of the aft peak is to be carried out after the sterntube has been fitted.		
Note ~~*4*~~*3*. The ~~highest point~~ top of the tank is generally to exclude hatchways.		
Note *4*. A hose test will be considered, *see Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.3.*		
Note *5*. ~~If leak or hydropneumatic testing is carried out, arrangements are to be made to ensure that no pressure in excess of 0,30 bar (0,30 kgf/cm^2) can be applied.~~ Watertight doors and hatches not confirmed watertight by a prototype test are to be subject to a hydrostatic test.		
Note *6*. ~~Watertight doors and hatches to be supplied with a test certificate stating the maximum pressure head for which they are suitable. For large watertight closing appliances that cannot be tested, *see Vol 1, Pt 4, Ch 3, 3.4 Construction and testing or Vol 1, Pt 4, Ch 3, 4.3 Construction and testing.*~~ For shell doors providing watertight closure, watertightness is to be demonstrated through prototype testing before installation. The testing procedure is to be agreed with LR prior to testing.		
Note *7*. ~~*See also Regulation 16 - Construction and initial tests of watertight doors, sidescuttles, etc.* Where the door has had the full hydrostatic test before installation, the hose test may be replaced by careful visual examination after full operational tests.~~ Other testing methods listed in *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests* can be considered, subject to the adequacy of such testing methods being verified.		
Note *8*. If the magazine is required to contain an overpressure, for example due to a ~~fire~~ munitions reaction, the testing requirements are to be specified by the magazine safety standard. Where magazines are not required to contain an		

overpressure, or required to be watertight, leak testing may be replaced by a visual examination.
Note *9*. All watertight doors and hatches are to be hose tested after installation. Hose testing is to be carried out from each side of a door unless, for a specific application, flooding is anticipated from only one side. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by an ultrasonic leak test or an equivalent test.
Note *10*. Where LO sump tanks and other similar spaces under main engines intended to hold liquid form part of the watertight sub-division of the ship, they are to be tested in accordance with the requirements for deep tanks (other than those listed elsewhere).
Note *11*. Independent tanks not confirmed watertight by a prototype test are to be subject to a hydrostatic test. A leak test is to be carried out after installation on board.
Note *12.* Where hose testing cannot be performed without damaging possible outfittings already installed, it can be replaced by a careful visual inspection of all the crossings and welded joints. Where necessary, dye penetrant test or ultrasonic leak test could be required.

Existing sub-Section 7.3 has been deleted and replaced with the following.

7.3 Structural testing – general requirements

7.3.1 Tanks which are intended to hold liquids, and which form part of the watertight sub-division of the ship, shall be tested for tightness and structural strength as indicated in *Table 6.7.1 Testing requirements*. Tanks which do not form part of the watertight sub-division of the ship need not be structurally tested providing that the watertightness of all boundaries of these spaces is verified by leak tests and thorough inspection.

7.3.2 Where a structural test is specified in *Table 6.7.1 Testing requirements,* unless specified otherwise, a hydrostatic test is to be carried out in accordance with *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.1*. Where practical limitations prevent a hydrostatic test being carried out, a hydropneumatic test in accordance with *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.2* may be conducted. All external boundaries of the tested space are to be examined for structural distortion, bulging, buckling, or other related damage and/or leaks.

7.3.3 A hydrostatic test or hydropneumatic test can be carried out afloat to confirm the structural adequacy of tanks, provided that a leak test is carried out and the results are confirmed as satisfactory before the vessel is afloat. The testing afloat is to be carried out by separately filling each tank and cofferdam to the test head given in *Table 6.7.1 Testing requirements*. An internal inspection of the tanks is to be made whilst the ship is afloat.

7.3.4 Consideration is to be given to the selection of tanks to be structurally tested. Selected tanks are to be chosen so that all representative structural members are tested for the expected tension and compression. Tank boundaries are to be tested from at least one side.

7.3.5 Compartments to be tested are to be structurally complete and all fittings which affect the watertight integrity of the compartment such as doors, hatches, manholes, penetrations, valves and glands are to be fitted.

7.3.6 In compartments containing the stabiliser fins, rudder stocks, sonar hull outfit, echo sounders, etc. the bearing houses are to be installed and the seating arrangements completed before testing.

7.3.7 Arrangements are to be provided to ensure the free passage of air from the top of the tank tested. The air pipe or indicator test plug may be used for this purpose.

7.3.8 Where necessary, additional temporary supports are to be fitted to the hull to prevent excessive deformation.

7.3.9 It is recommended that a leak test in accordance with *Vol 1, Pt 6, Ch 6, 6.7 Watertight collars* is carried out before the structural test commences to identify any leak paths which may compromise the structural test.

7.3.10 Where it is intended to carry out structural tests after the protective coating has been applied, welds are to be leak tested prior to the coating application.

7.3.11 For welds other than manual and automatic erection welds, manual fillet welds on tank boundaries and manual penetration welds, the leak test may be waived provided that careful visual inspection is carried out, to the satisfaction of the Surveyor, before the coating is applied. The cause of any discolouration or disturbance of the coating during the test is to be ascertained, and any deficiencies repaired.

7.3.12 Equivalent proposals for testing will be considered.

7.3.13 Where it is intended to carry out structural tests after the protective coating has been applied, welds are to be leak tested prior to the coating application.

Existing sub-Section 7.4 has been deleted and replaced with the following.

7.4 Structural testing for Naval ships

7.4.1 For tanks of the same structural design, configuration and the same general workmanship, as determined by the attending Surveyor, a structural test need only be carried out on one tank, provided that all subsequent tanks are tested for leaks by an air test.

7.4.2 Where the structural adequacy of a tank has been verified by structural testing on a previous vessel in a series, tanks of structural similarity on subsequent vessels within that series (which are built at the same shipyard) need not be structurally tested, provided that the watertightness of all exempt tanks is verified by leak tests and thorough inspection. However, structural testing is to be carried out for at least one tank of each type of tank on every vessel in the series.

7.4.3 For sister ships built two or more years after the delivery of the last ship of the series, the application of the provisions of *Vol 1, Pt 6, Ch 6, 7.4 Structural testing for Naval ships 7.4.2* will be specially considered provided that the general practices, equipment and workmanship of the shipyard have been maintained continuously, and an non-destructive testing programme is implemented for the tanks not subject to structural tests.

7.4.4 Tanks exempted from structural testing in *Vol 1, Pt 6, Ch 6, 7.4 Structural testing for Naval ships 7.4.2* will require structural testing if found necessary after the structural testing of the first tank.

7.5 Leak testing

7.5.2 Testing is to be carried out by applying an efficient indicating liquid, e.g. soapy water solution, to the weld or outfitting penetration being tested, while the tank or compartment is subject to an air pressure of at least 0,15 bar ~~(0,15 kgf/cm^2)~~.

7.5.3 It is recommended that the air pressure be raised to 0,2 bar ~~(0,2 kgf/cm^2)~~ and kept at this level for about one hour to reach a stabilised state, with a minimum number of personnel in the vicinity, and then lowered to the test pressure prior to inspection.

7.5.7 Where a leak test is specified in *Table 6.7.1 Testing requirements,* unless specified otherwise, a tank air test, compressed air fillet weld test or vacuum box test is to be carried out in accordance with the applicable requirements of *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.4* to *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.6.* A hydrostatic or hydropneumatic test conducted in accordance with the applicable requirements of *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.1* and *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.2* will be accepted as a leak test on the condition that safe access to all joints being examined is provided, *see Vol 1, Pt 6, Ch 6, 7.8 Safe access to joints 7.8.1.* Where a hydrostatic or hydropneumatic test is applied as a leak test, the external boundaries are to be free of any liquid residue prior to the commencement of the test.

7.5.8 A hose test will be accepted as means of verifying the tightness of joints only in specific locations, identified in *Table 6.7.1 Testing requirements.*

7.5.9 Air tests of joints can be conducted at any stage during construction provided that all work that might affect the tightness of the joint is completed before the test is carried out.

7.5.10 Where acceptable to the attending Surveyor, provided that careful visual inspections show a continuous uniform weld profile shape, free from repairs, and the results of selected NDE testing show no significant defects, the leak testing of automatic butt welds and semi-automatic (flux core arc welding) butt welds may be omitted.

Existing sub-Sections 7.6 and 7.7 have been deleted.

~~7.8~~ 7.6 Gastight testing

Existing paragraphs 7.8.1 and 7.8.2 have been renumbered 7.6.1 and 7.6.2.

Existing paragraphs 7.8.3 to 7.8.5 have been deleted.

~~7.8.6~~ 7.6.3 In certain compartments that are not able to be made fully gastight due to operational requirements, a greater fall in pressure may be accepted at the discretion of the surveyor. In no case is the pressure to drop more than 0,0075 ~~Bar (0,0075 kgf/cm^2)~~bar (75 mm of fresh water~~)~~ in 10 minutes from an initial 0,015 ~~Bar (0,015 kgf/cm^2)~~ bar (150 mm of fresh water).

Existing paragraph 7.8.7 has been renumbered 7.6.4.

7.7 Definitions and details of tests

7.7.1 **Hydrostatic test** is a test conducted by filling a space with a liquid to a specified head. Unless another liquid is approved, the hydrostatic test is to consist of filling a space with either fresh or sea water, whichever is appropriate for the space being tested, to the level specified in *Table 6.7.1 Testing requirements.* For tanks intended to carry cargoes of a higher density than the test liquid, the head of the liquid is to be specially considered.

7.7.2 **Hydropneumatic test** is a combination of a hydrostatic test and a tank air test, consisting of partially filling a tank with water and conducting a tank air test on the unfilled portion of the tank. A hydropneumatic test, where approved, is to be such that the test condition in conjunction with the approved liquid level and air pressure will simulate the actual loading as far as practicable. The requirements for tank air testing shown in *Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.4* and the safety precautions given in *Vol 1, Pt 6, Ch 6, 7.5 Leak testing* are to be adhered to.

7.7.3 **Hose test** is a test used to verify the tightness of joints with a jet of water. The jet of water is to be directed perpendicular to the joint. It is to be carried out with the pressure in the hose nozzle maintained at not less than 2,0 bar during the test. The hose nozzle is to have a minimum inside diameter of 12 mm and is to be situated no further than 1,5 m from the joint. Where a hose test is not practical because of possible damage to machinery, electrical equipment insulation or outfitting items, it can be

replaced by a careful visual examination of welded connections, supported by an ultrasonic or penetration leak test, or an equivalent.

7.7.4 **Tank air test** is to be used to verify the tightness of a compartment by means of an air pressure differential and leak indicator solution. An efficient indicating solution (e.g. soapy water) is to be applied to the weld or penetration being tested and is to be examined whilst an air pressure differential of not less than 0,15 bar is applied by pumping air into the compartment. Arrangements are to be made to ensure that any increase in air pressure does not exceed 0,30 bar. A U-tube with a height sufficient to hold a head of water corresponding to the required test pressure is to be used for verification and to avoid overpressure. The cross-sectional area of the U-tube is not to be less than that of the pipe supplying air to the tank. Alternatively, two calibrated pressure gauges can be considered acceptable. All boundary welds, including pipe connections in the compartment are to be examined twice. The first is to be examined immediately upon applying the leak indication solution; the second approximately five minutes afterwards.

7.7.5 **Compressed air fillet weld test.** This test consists of compressed air being injected into one end of a fillet welded joint and the pressure verified at the other end of the joint by a pressure gauge. Pressure gauges are to be arranged so that an air pressure of at least 0,15 bar above atmospheric pressure can be verified at each end of all passages within the portion being tested. A leak indicator solution is to be applied and the weld line examined for leaks. A compressed air test can be carried out for partial penetration welds where the root face is greater than 6 mm.

7.7.6 **Vacuum box test** is a test used to verify the tightness of joints by means of a localised air pressure differential and leak indicator solution. The test is to be conducted with the use of a box with air connections, gauges and an inspection window that is to be placed over the joint being tested with a leak indicator solution applied. The air within the box is to be removed by an ejector to create a vacuum, i.e. a pressure differential of 0,20 to 0,26 bar inside the box.

7.7.7 **Penetration test** can be used where a hose test is not practical to assess butt welds, *see Vol 1, Pt 6, Ch 6, 7.7 Definitions and details of tests 7.7.3,* by applying a low surface tension liquid to one side of a compartment boundary. When no liquid is detected on the opposite side of the boundary after expiration of a defined period of time, the verification of tightness of the compartment's boundary may be assumed. A developer solution can be applied on the other side of the weld to aid leak detection.

7.7.8 **Gastight test**. The pressure in the compartment is to be brought to 0,015 bar and the supply isolated. The fall in pressure after 10 minutes is not to be greater than 0,0013 bar. If the specified pressure drop occurs, the compartment is to be inspected for leaks and the test repeated until the specified standard is achieved. A U-tube filled with water to a height corresponding to the test pressure is to be fitted for verification and to avoid overpressure. The U-tube is to have a cross-section larger than that of the air supply pipe.

7.7.9 **Protective coating**. Protective coating is the coating system applied to protect the structure from corrosion. This excludes the prefabrication primer.

7.8 Safe access to joints

7.8.1 For leak tests, safe access to all joints under examination is to be provided.

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